FIBRINOUS CALCULI IN THE KIDNEY.

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In considering urinary calculi, we are accustomed to think of the difference in consistence between the hard uric acid and oxalate of lime calculi, and the softer stones composed of the alkaline phosphates; the former so hard as to offer great resistance to the lithotrite, the latter crumbling easily.

But we are apt to forget that there are other bodies even softer, whose definite form and infiltration with crystalline deposits, bring them within the general classification of urinary calculi. They are sometimes spoken of as "blood calculi," "fibrinous concretions" or "colloid stones,"—are not very common, and the number of reported cases is very small. Their variety, and their bearing upon the theories in regard to the formation of urinary calculi, would seem to make them of enough interest and importance to warrant a brief description of such a case which came under our observation in 1906.

Miss A. C., 56 years old, was referred to the Memorial Hospital May 20, 1906, by Dr. P. T. O'Brien, of Clinton, Mass. Her father died of typhoid fever, her mother of "heart disease"—there is a history of tuberculosis on the father's side, but none in the immediate family; five sisters and one brother are dead; one after a long illness, at 24 years, nature not known,—the others, all from acute infectious diseases. The sister who is living, has been "troubled with gravel and has passed hard stones," but is now in excellent health, 60 years old.

She had pneumonia at seven, was sick two or three months, and has ever since been subject to coughs; has occasionally had a bloody expectoration. Had typhoid at 17, and jaundice at 19.

For several years was troubled with indigestion, pain in epigastrium and nausea, and in 1902, was jaundiced again. On September 6, 1902, at Memorial Hospital, she was found to have an enlarged gall-bladder easily seen and felt, with the liver extending three inches below the level of the ribs; a gall-stone was found obstructing the cystic duct, and was successfully removed. Menstruation had ceased when she was 50 years old.

From the time she was 15 years old, until she was 30, she passed gravel in the urine—a gray-colored sand, that settled in bottom of chamber, would not wash out, and often had to be scraped out; none of this between 30 and 35, but in February, 1885, while dressing, was taken with severe pain in right side of back, with urgent desire to urinate. The urine was dark blood color, with small clots. During the morning, urinated every 15 to 30 minutes and the dark color of the first urine gradually changed to a bright blood color. Three days later the blood and increased frequency had disappeared, and the urine had become normal.

Two months later, after walking up a hill, had a second attack of pain, similar in character, but much less severe than the first, lasting but a few days; blood showed in urine twice on first day of attack. The next winter, 1885-1886, for two or three months, had several attacks of pain along line of right ureter; these occurred in day or night, often with several weeks between, lasting several hours, and disappearing gradually.

These attacks were always accompanied by smoke-colored urine, in which was a sediment of "a black, smoky dust." During the period in which these attacks occurred, she was unable to start quickly, reach far above her head, or go up a hill without inducing pain in her right side. Once in reaching for a picture, hanging on the wall, she was taken immediately with a pain which began one of these attacks.

From that time until 1904, she felt pretty well, did considerable work about the house, and had little or no trouble with her side. In 1902, at the time of her cholecystotomy, examination of the urine showed that it had a specific gravity of 1017, was acid, contained a very faint trace of albumin, no sugar, and in the sediment a few leucocytes and a few red blood corpuscles. On the day following the operation, there were also numerous epithelial and granular casts.

Present Illness.—Two years ago, while riding in an electric car, felt annoying pain in right back, extending down right side toward bladder. Urinated once an hour, urine contained no blood, but was thick and ropy. Similar attacks, beginning with severe, sudden pain, and lasting five or six days, recurred at irregular intervals, until present.

These attacks confined her to bed, and were accompanied by chills, fever and vomiting. For several months the attacks were infrequent, but toward spring increased in frequency, lasted longer, and were more severe. In August, 1905, she passed four small stones and from then until the time of the operation, thinks she passed between 30 and 40; some as large as a good-sized bean.

Miss C. was very thin, skin had a yellowish color, tongue was coated, breath sounds were harsh on the left side anteriorly, heart was normal. There was marked tenderness on the right side of the abdomen, but the right kidney was but indistinctly felt, tender, but not enlarged. Pulse, 68, temperature, 98.5°; respiration, 20.

The urine, on entrance, had a specific gravity of 1020, was alkaline, had a faint trace of albumin, no sugar. In the sediment were no casts, and no blood, many bacteria, mucus, few leucocytes, epithelial cells, amorphous phosphates and dicalcic phosphatic cystals.

A cystoscopic examination of the bladder was made on the 26th of May, by Dr. H. W. Beal, with the following results:

Nothing abnormal noted in appearance of bladder. Twenty-seven c.c. of urine were withdrawn by catheterization of the ureters from each kidney; that withdrawn from the right kidney was yellow, alkaline, sp. gr. 1010; it contained a distinct trace of albumin, no casts, numerous amorphous urates, no tubercle bacilli, but many uric acid crystals, epithelial cells, bacteria and pus-cells, with a few red blood corpuscles. From the left kidney, amber, acid, sp. gr. 1026, with marked trace of albumin, uric acid crystals, epithelial cells, and red blood corpuscles.

In spite of the presence of red blood corpuscles and epithelial cells in the urine of the left kidney, inasmuch as the amount of urine and its specific gravity were satisfactory, it was determined to cut down upon the right kidney, which had been the constant seat of the pain, and from the presence of the pus-cells and bacteria, was evidently the seat of a marked pyelitis.

Accordingly, on June 1, 1906 the kidney was exposed through a six inch lumbar incision; its external appearance was normal but the pelvis and upper end of ureter were markedly dilated; a small incision revealed the presence of numerous calculi in pelvis of kidney, extending well down into the ureter. The kidney was removed entire, and the end of the ureter was sutured to the skin.

The operation was done under gas-ether, and occupied 35 minutes; her convalescence was delayed by a severe bronchitis, and some superficial suppuration, so that she did not leave the hospital until July 3, 1906, five weeks after the operation.

Examination of the urine, made after the operation, showed always a distinct trace of albumin, a specific gravity ranging from 1010 to 1024 a few hyaline casts on the second day, none afterwards, and always many leucocytes. Four weeks after the operation, she was passing 13.68 Gm. of urea in 24 hours.

She was re-admitted to the hospital August 27, 1906, with a sinus six inches deep in the line of incision; this sinus was enlarged, curetted and packed with iodoform gauze; it was entirely healed, and she returned home on September 17th. At this time, her urine still contained a large trace of albumin, and many leucocytes. A catheterized specimen was not obtained.

Subsequent History.—At the present time, Miss C. reports that her general health has been very much better since the operation; that she has weighed more than for five or six years past, and that she has been able to work. She looks well, and physical examination reveals nothing abnormal. She passes about 24 oz. of urine in the 24 hours, and has no increased frequency, and no pain.

Examination of urine, obtained per catheter, showed normal color, acid reaction—specific gravity, 1014. Albumin, by nitric acid absent; by heat test, a slight trace. Sediment, obtained by centrifuge, showed an occasional leucocyte, and very few bacteria —amount of urea was 1 per cent.

We think it may be safely inferred, that the remaining kidney presents none of the pathological conditions which characterized the one which was removed. Examination of the kidney after its removal showed that the capsule was not adherent and the renal substance was but little thickened; the pelvis of the kidney was tensely distended and completely filled with clay-colored bodies which turned brown after exposure to the air, were of the consistency of moderately hard putty, and varied in size from a large bean to the head of a pin.

There were 10 or 12 large ones, and a great many smaller ones, more than 100 in all; all, even the smallest, presented smooth, faceted surfaces, like those of gall-stones. Their general appearance, as they lay in the pelvis, and extended down into the ureter, is admirably shown in the accompanying drawing.

The specimen was subsequently sent to Dr. F. B. Mallory, whose report is as follows:

"Specimen consists of kidney, incised through the hilus, and preserved in alcohol. The kidney is a little enlarged, and the pelvis and beginning of the ureter are considerably distended. The latter contained in the fresh state many soft, more or less rounded, reddish-gray masses, some of which are still attached to the calices of the kidney; the others are free in the alcohol. (Figs. 1 and 2.)

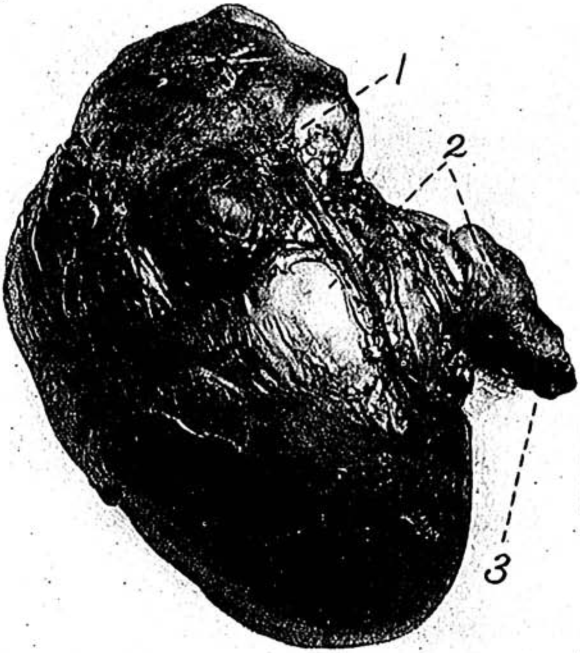
"They vary very much in size; the largest received measures 1.8 x 1.3 x 0.9 cm. They are irregular in shape from pressure against each other, are easily broken up, and seem to be composed of thin layers. Microscopically, after decalcification the material seems fairly homogeneous; but it shows a concentrically laminated arrangement, and in places there is a meshwork, evidently composed of fibrin threads, out of which each calculus is probably formed."

Some of the calculi were sent to Dr. R. L. Emerson, to determine the nature of the infiltrating salts, who reports: "The renal calculi which I received from you July 16th, are composed chiefly of calcium phosphate. There was mixed with the calcium phosphate, more or less altered blood which tended to cover the stones at various times during their formation and accounts for their more or less concentric appearance. I could get no test for uric acid, triple phosphate, or calcium oxalate."

These calculi consist, therefore, of alternating layers, concentrically arranged, of calcium phosphate and fibrin, and may be properly classified as fibrinous calculi.

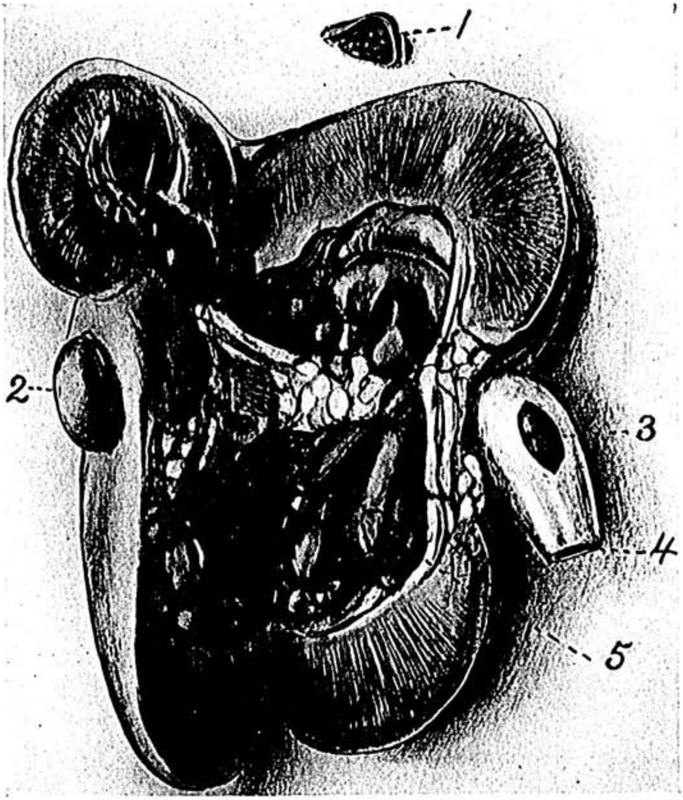
The first mention that we have been able to find of fibrinous calculi, occurs in Marcet's "Calculous Disorders" (1817), in which he says of a calculus sent to him by Sir Astley Cooper, that "It was neither cystic nor uric, but that it appeared to consist of hardened animal matter, probably of the albuminous kind; that upon closer examination its properties correspond exactly to those of fibrin, and therefore if the occurrence of similar concretions should render it necessary to give them a name, they might, I think, without impropriety, be called fibrinous concretions." The patient from whom this

FIG. 1.



1. Surface cyst. 2. Pelvis and upper end of ureter distended with calculi. 3. Cut ureter.

FIG. 2.



1. Section of calculus. 2. Surface cyst. 3. Window showing pelvic portion of ureter crowded with calculi. 4. Cut ureter. 5. Pelvis of kidney, dilated and crowded with calculi.

specimen was obtained, had already passed three calculi of similar character, and all nearly the same size, viz., "Size of a pea."

In 1837, Dr. Hodgkin described two calculi taken from the bladder of a boy, aged two years; and the description is so like the calculi found in our case, that it seems worth repeating.

> "Instead of presenting the hardness and resistance of solid bodies composed of earthy matter, they possess, on the surface at least, a degree of softness and elasticity, as if covered with a fleshy layer. The material of which the surface was composed, exhibited a slight degree of translucence, not unlike that of some blighted acephalocyst membranes. These unusual characters induced at first some doubt respecting the nature of these bodies.
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> "Section made through one of them, showed that they in part consisted of an opaque white substance, having an earthy texture arranged in concentric but fragile layers. Two or three thin layers, consisting of a material precisely similar to that of which the external coating of the calculi was composed, were situated between the layers possessing the earthy character.
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> "Although the earthy layers were so brittle as to be crushed by the act of making the section, the fragments were so completely retained in their relative situations by the tenacity of the membranous layers, that the two portions into which the calculus was divided, were able to retain their form and cohesion."
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> Dr. Hodgkin believed that, "A nucleus existing in the bladder at the time became invested with coagulated fibrin, as a stick does when agitated in recently drawn blood; that when the character of the urine again changed the deposition of phosphates took place and inclosed the fibrinous layer."

The repetition of these occurrences appears sufficiently to account for the production of these calculi, and to be strictly analagous to the process by which other alternating calculi are formed.

Civiale refers to bladder masses which have to be exposed before they can be recognized as true semifluid calculi, in which the animal matter greatly exceeds the mineral matter; and further, of small gravel stones of soft consistency, combined with a large quantity of semiliquid substance.

His references are plainly to the thick mucus, which he says often dries outside the bladder in dirty gray scales, and can collect on the surface of a vesical calculus and there produce a real horny layer. He also mentions a fibrinous calculus, the size of a bean, yellow, and half transparent, which was extracted from the bladder of a cadaver by Sir Benjamin Brodie. It had the appearance of amber, lost much of its volume in drying, and its presence had not been suspected during life.

In 1857, J. Scott Alison, in examining the body of a man who had died of consumption, found "the left kidney to be greatly atrophied, changed in structure, and to have the infundibula and pelvis stuffed with hard bodies, most of which are of a coal black color. The largest of these is the size of a horse bean, looks somewhat worn and disintegrated, and at one point resembles a piece of decayed wood. At one side it is black from the pressure of altered blood. It is very light in weight, and is composed of blood and phosphate of lime."

To these he gave the name of blood calculi, and explained their formation by the presence of an "inflammatory action, set up perhaps by the pressure of small calculi of phosphate of lime. Blood was probably effused in consequence, and from suppression of urine, remained in the infundibula and pelvis, and failed to be washed down the ureter. This blood hardening, would form the calculi which were discovered."

Roberts, in his "Treatise on Urinary and Renal Disease," refers also to calculi of inspissated blood, and refers to a case in which several such concretions were found loose in the infundibula and pelvis of a kidney which had been ruptured by external violence. These seem to have contained little or no earthy matter, but he says, "Such concretions sometimes serve as nuclei for uric acid or oxalate of lime calculi."

Generisch, in 1903, showed "a colloid stone from the renal pelvis, found in a 39-year-old porter; granular contracted kidneys, and cardiac hypertrophy were present."

"The calculus is the size and shape of a castanea nut, tapering at one end, measuring 32 x 29 x 24 mm., weighing 13.9 Gm. The surface is smooth, with the exception of protuberences the size of a bean in two places. The color is grayish-brown, somewhat translucent. A needle can be inserted 4 mm. deep into the calculus, when it strikes a hard nucleus.

"On section, the calculus shows a hard nucleus, the size of a hemp-seed, formed of black calcium oxalate, surrounded by a softer light red layer of uric acid. The latter was followed by a firm layer of calcium oxalate, which in turn was surrounded by a yellowish mantle of urates."

The tetrahedral nucleus described above, "was covered with a colloid layer, in the form of scales and lamellæ, which could be scraped off with the finger-nail or cut with a knife." He goes on to say, "that the colloid covering of the calculus seems to give a hint as to the growth of calculi in general."

"The scales and lamellæ point to the conclusion that the organic formed substance of the calculus is deposited first, and the inorganic substance added later. On the other hand it is not impossible that a colloid layer might have been deposited in the renal pelvis, secondarily and independently of the calculus formation; as we are dealing with a case of contracted kidneys in which there is abundant formation of colloid substance."

In 1904, Dr. Elliott, of Boston, published an account of two fibrinous concretions successfully removed from the bladder of a man 54 years of age. "They were of a lightish-yellow color, with smooth surfaces, slightly wrinkled, and of the consistency of firm putty. The structure was homogeneous, slightly gritty, giving the impression of coagulated material, fibrin and mucus mixed with particles of urinary salts, in the centre of which was a small nucleus, composed chiefly of calcic phosphate."

In 1906, appeared an article by Dr. Piollet, on "Calculous Pyonephrosis with Abnormal Organic Concretions—Lumbar Nephrostomy—Recovery." The essential features of this most interesting case were the removal, by incision of the kidney, of half a litre of thick, yellow, fetid pus, about 50 dark soft concretions, and two round hard calculi.

These soft concretions varied in size from that of a grain of wheat to that of a large nut. They were elastic, like rubber; in shape, generally round, with facets flattened by reciprocal pressure. They proved to be almost entirely composed of organic matter in concentric layers, albuminoids and fibrin. The ashes were composed of phosphates, in very small quantities.

The similarity between the calculi described in these reports, and those found in our own case, will be readily observed. In none were so many found, however, as in our patient; and in but one, was the smooth, facetted appearance noted, such as is commonly found in gall-stones. Most of them present a framework of fibrin, in which have been deposited crystals of phosphate of lime.

If we accept Rainey's theory of the formation of urinary calculi by molecular coalescence, a theory which has been further elaborated by the observations and experiments of Ord and Ebstein,—these differ from the more common calculi simply in having a large excess of the colloid or cement in which the inorganic salts of the urine are deposited,—from the great predominance of this cement, we are able easily to demonstrate that it is made up of fibrin, and not of mucus, pus, or other albuminoids.

The origin of this fibrin in our own case, as is believed usually to be true of fibrinous calculi, lies in a previous hæmaturia, which from the patient's history, occurred at several different times, and quite profusely a few years before she came under our observation.

The cause of the hæmaturia is not clearly established by the examination of the kidney, and we have no means of knowing whether the bacterial invasion of the renal pelvis preceded or followed the hemorrhage.

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